AFWA

COMPARATIVE STUDY

AGENDA

BACKGROUND

DRY FIRE DATA

LIVE FIRE DATA

CONCLUSIONS

PROS & CONS

WAY AHEAD

BACKGROUND

- March-April 2005 Dry Fire assessment of:
  AFWA,
  Pibal, &
  Standard (Default) MET
  vs. MMS-provided MET

- April-May 2005 Live Fire assessment

JAAWIN

- Joint Air Force and Army Weather Information Network
- Web-based interface to the access of weather data
- Provided as a public service of the Air Force Weather Agency (AFWA)
- Information considered public information
- Data derived from satellite, surface observations, & Regional/Local RAOBs
- Data is modeled

IGrADS

- Interactive Grid Analysis & Display System
- Product of JAAWIN
- Provides a wide variety of weather products (forecast maps, chemical downwind predictions, etc)
- Provides Alphanumeric products (Field Artillery Forecast-METCM)
- Standard Grids of 45km or 15km
- 5km grids by request

PARAMETERS – DRY FIRE

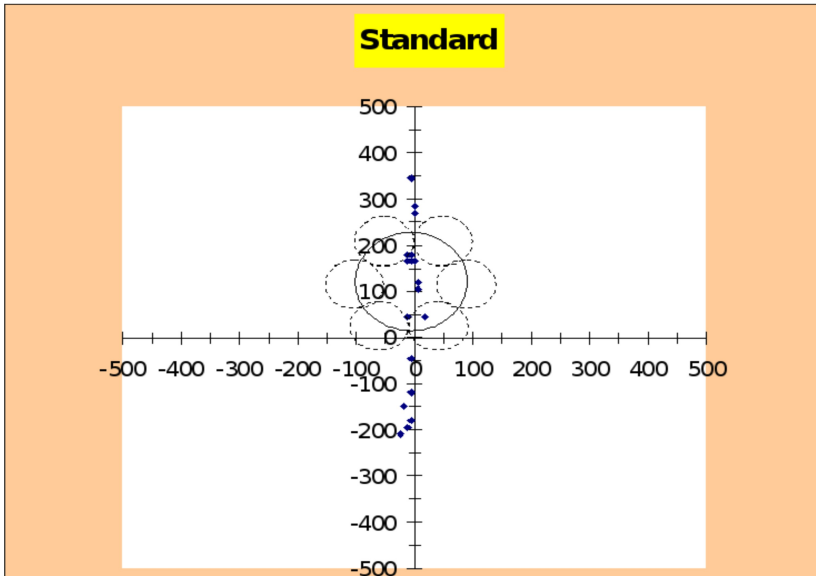
- Collect twenty sets each concurrently of Met data from MMS, AFWA, PIBAL, Standard
- Compute technical gunnery solution using each data set at different ranges & charges for M198 and M119A1
- Compute median radial error in comparison assuming MMS is the standard
- Display results graphically in scatter plot

DATA SUMMARY

				AFWA						PIBAL						STANDARD (DEFAULT)					
WPN	CHG	MISSIONS		RNG [M]	ΔD	MRE [M]	MIN	MAX	MEAN RE	RNG [M]	ΔD	MRE [M]	MIN	MAX	MEAN RE	RNG [M]	ΔD	MRE [M]	MIN	MAX
M119A1	CHG 7	20	AVG	39	11	57	28	140	67	15	4	34	0	88	29	88	15	188	22	359
	CHG 8	20	AVG	52	5	82	10	158	90	10	14	51	20	149	64	149	67	291	39	468
M198	5GB	20	AVG	41	6	42	18	120	52	4	2	25	0	75	28	44	7	165	45	345
	7WB	20	AVG	80	10	100	36	266	113	2	9	60	14	182	65	181	51	352	74	578
	8S	20	AVG	123	7	143	55	450	177	42	12	138	25	426	182	856	123	1129	105	1455
TOTAL		100		67	8	82	10	450	100	14	8	44	0	426	74	263	53	269	22	1455

M198 155mm
CHG 5GB
RNG 6000 M
Btry 6, Circular Sheaf

Median Radial Error @ 6,000M:
AFWA 42M
Pibal 25M
Standard 165M



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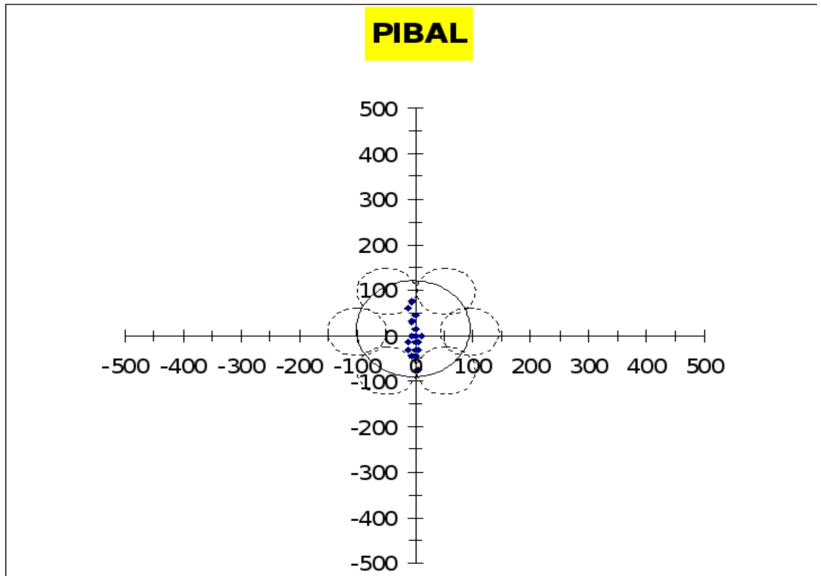
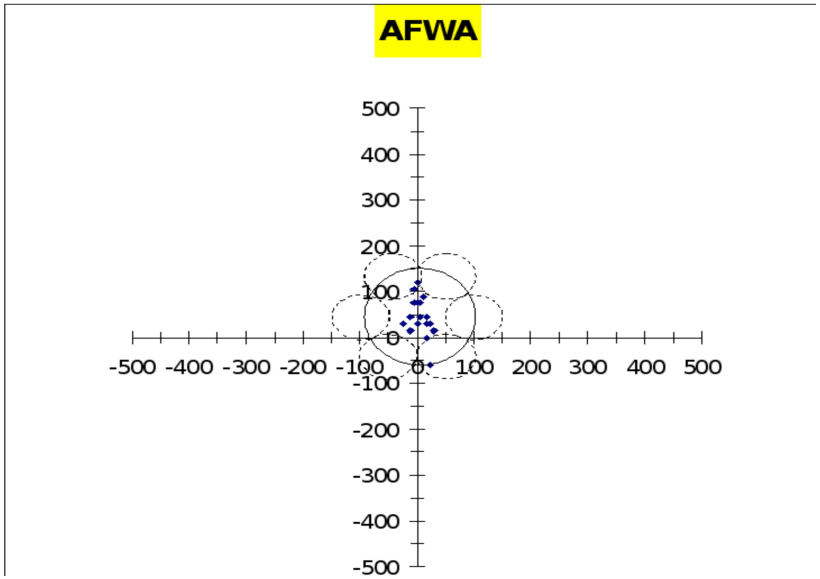
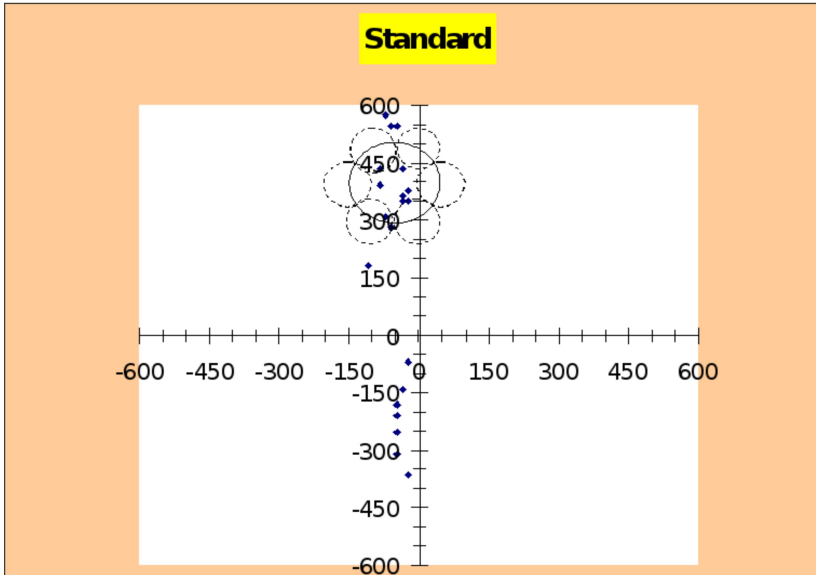




M198 155mm
CHG 7WB
RNG 12000 M
Btry 6, Circular Sheaf

Median Radial Error @ 12,000M:
AFWA 101M
Pibal 50M
Standard 352M



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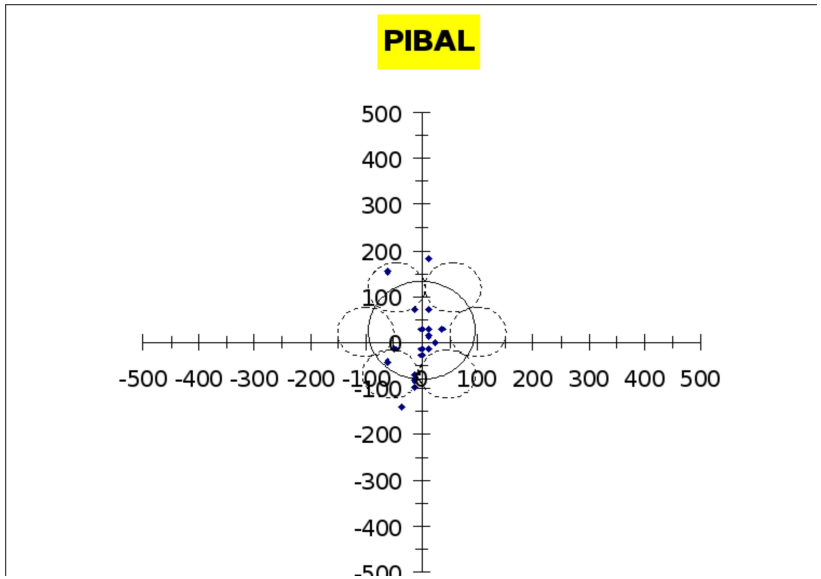
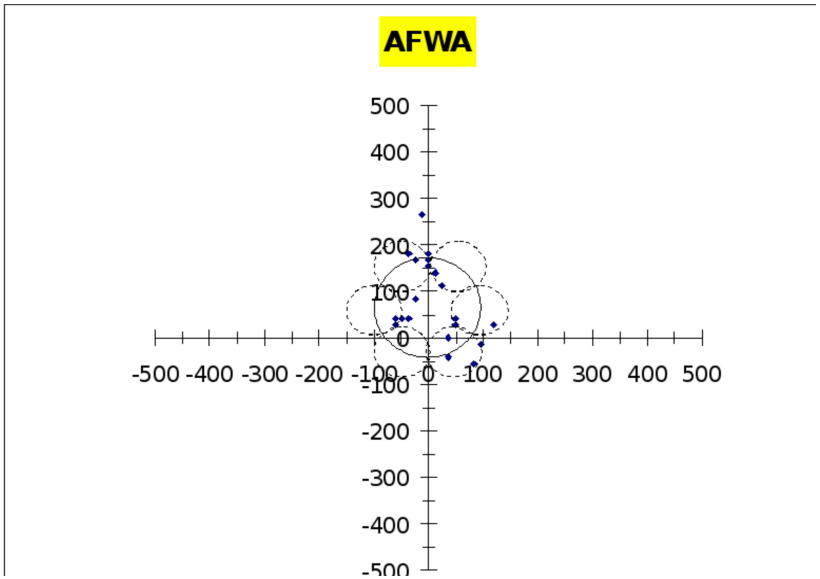
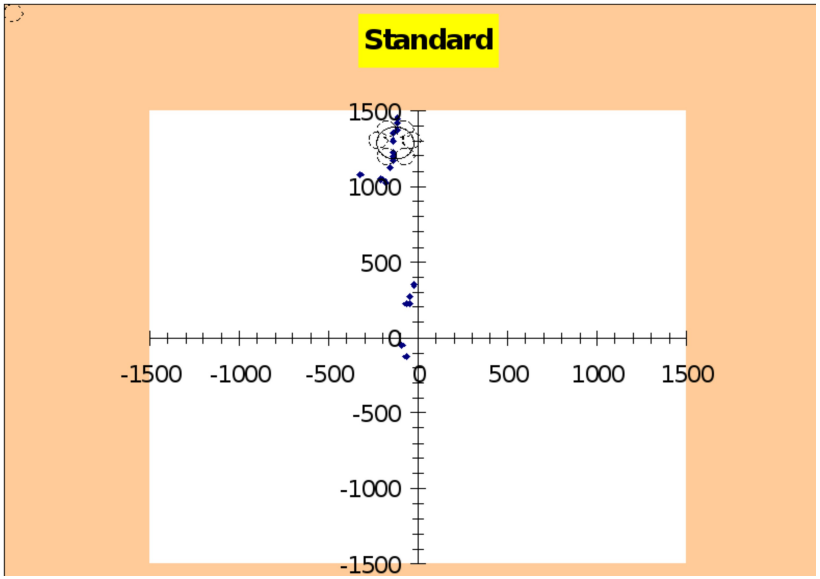




M198 155mm
CHG 8S
RNG 23000 M
Btry 6, Circular Sheaf

Median Radial Error @ 23,000M:
AFWA 143M
Pibal 138M
Standard 1129M



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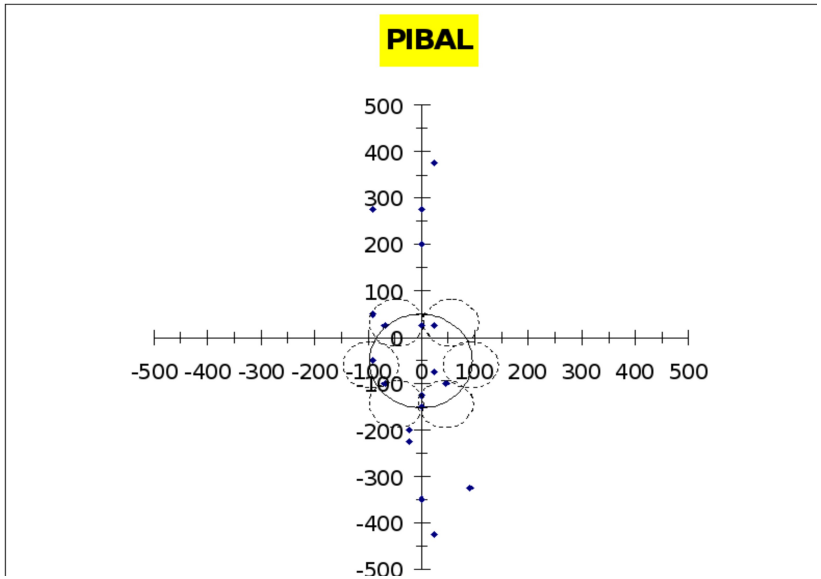
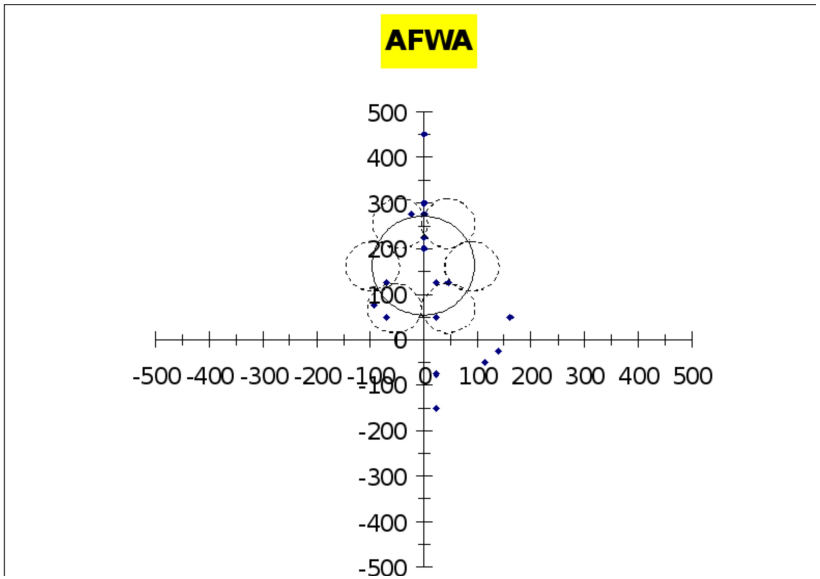
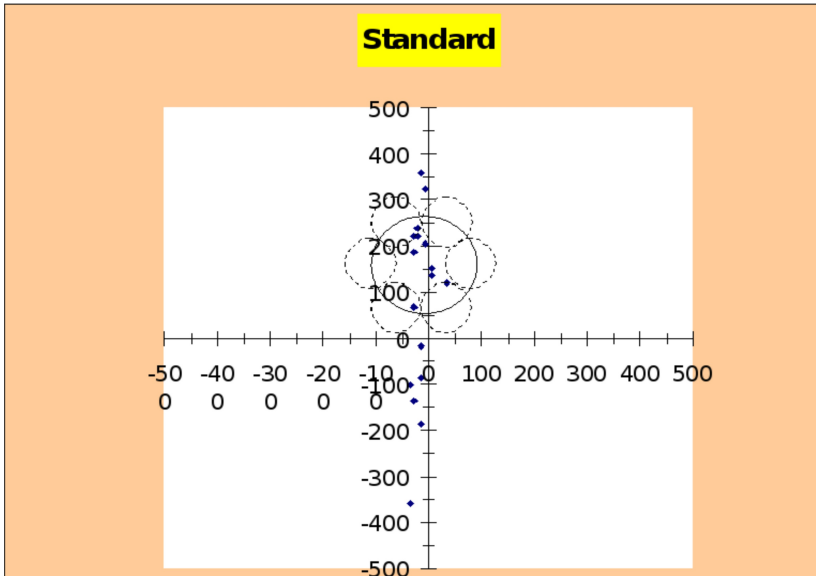




M119A1 1505mm
CHG 7
RNG 7000 M
Btry 6, Circular Sheaf

Median Radial Error @ 7,000M:
AFWA 57M
Pibal 34M
Standard 189M



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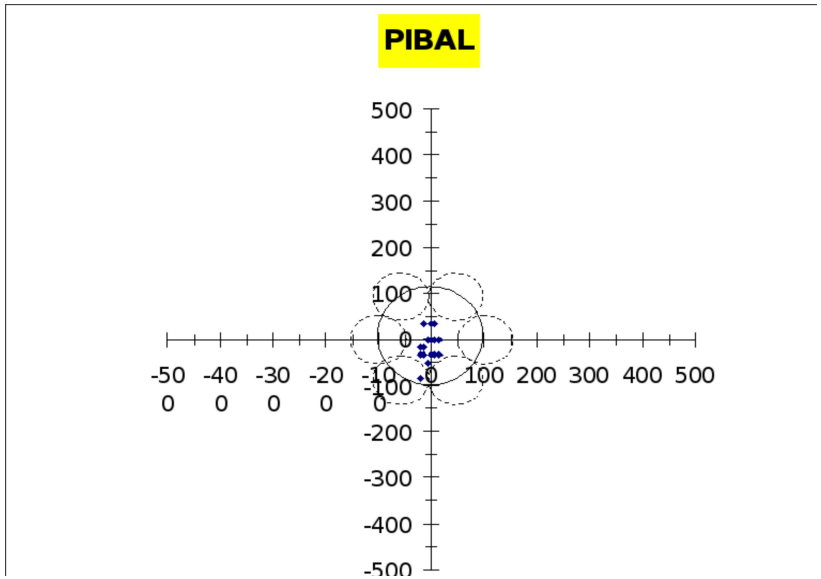
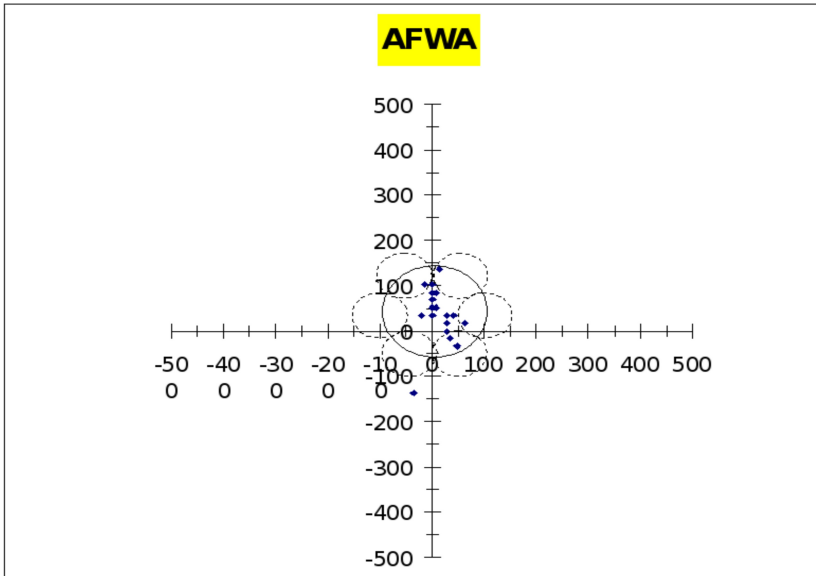
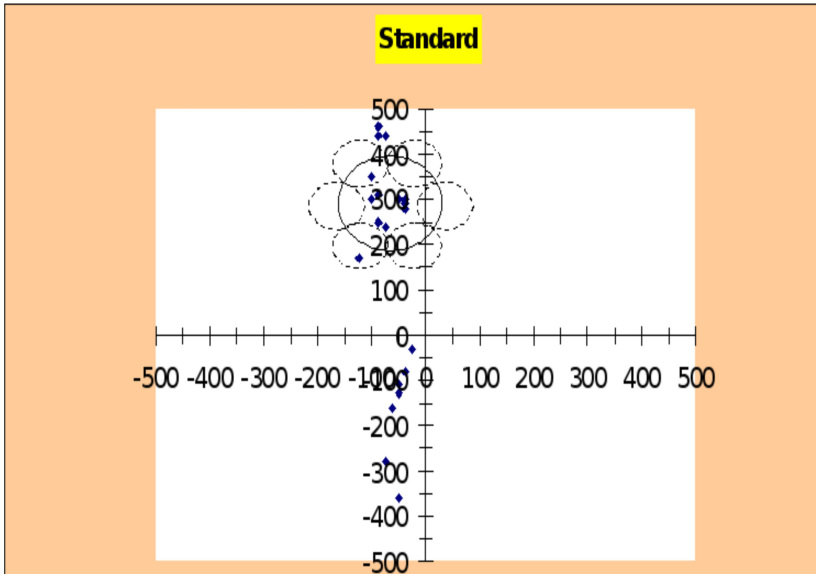




M119A1 1505mm
CHG 8
RNG 12500 M
Btry 6, Circular Sheaf

Median Radial Error @ 12,500M:
AFWA 83M
Pibal 51M
Standard 291M



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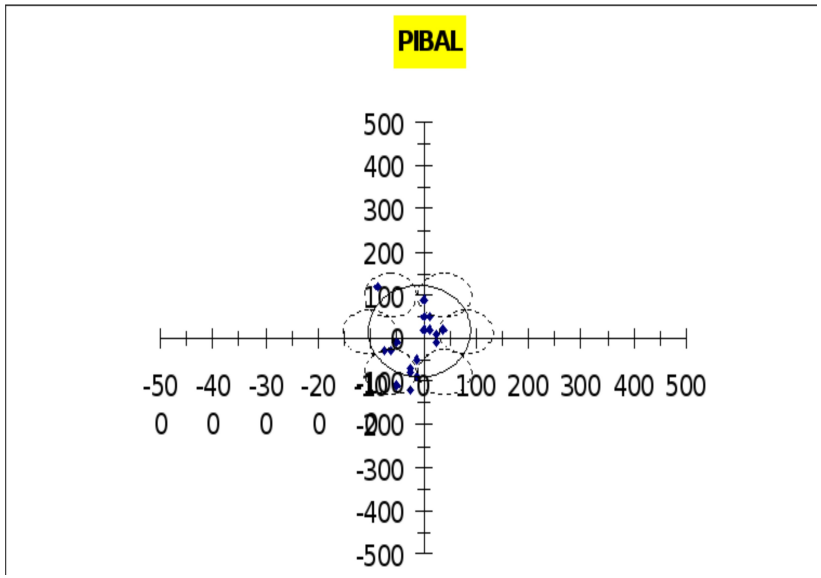
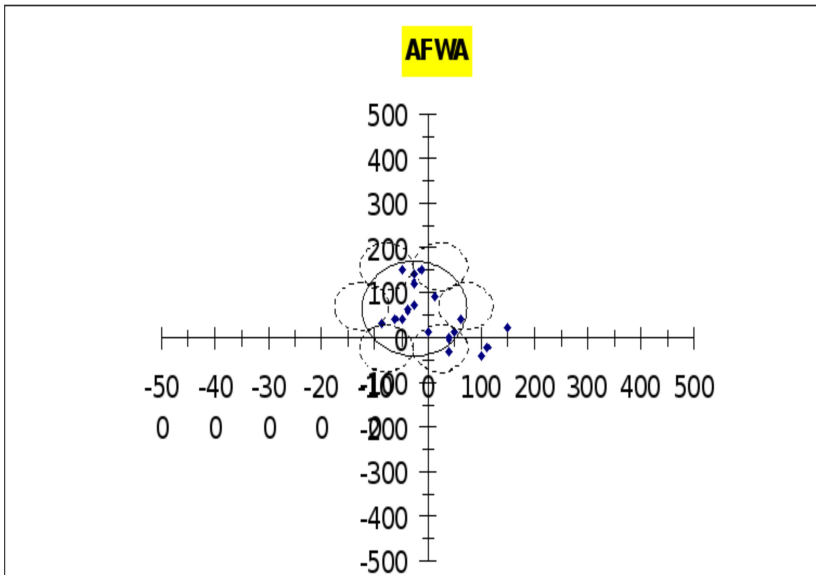




CONCLUSIONS

- AFWA and Pibal prove to be much more accurate in computing gunnery solution than Standard Met
- Standard Met should be absolute last choice

PARAMETERS – LIVE FIRE

- Collect concurrent sets of Met data from MMS, AFWA during 30TH REGT LIVE FIRE
- Compute technical gunnery solution using each data set
- Compute mean radial error in comparison, assuming MMS is the standard (center plot)
- Display results graphically in scatter plot
- Compared only data for which *all variables but MET* were verified identical in both databases

DATA SUMMARY

ALL DATA

TOTAL VOLLEYS FIRED	257
AVG QE	338.0
AVG ABSOLUTE VARIANCE - DF	1.10
AVG ABSOLUTE VARIANCE - QE	1.20

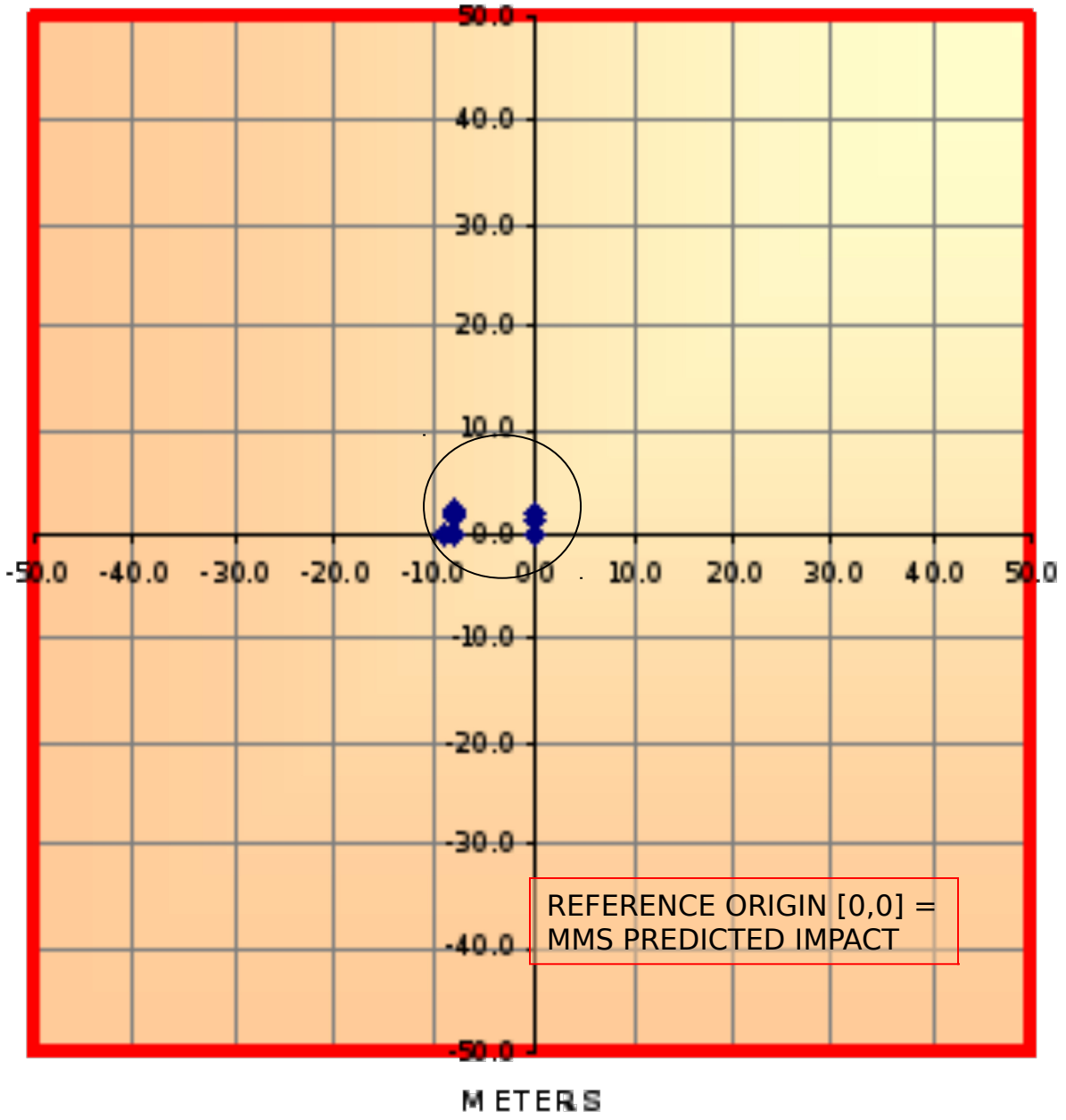
							ABS Δ RNG [M]	Δ RNG [M]	ABS ΔD	ΔD	RADIAL ERROR
DAY 1	12	MISSIONS	CHG 3	47	VOLLEYS	AVG	5.0	-5.0	0.9	-0.8	5.3
DAY 2	14	MISSIONS	CHG 3	70	VOLLEYS	AVG	9.9	-8.9	4.9	-0.1	12.5
DAY 3	9	MISSIONS	CHG 2	34	VOLLEYS	AVG	6.0	-3.2	2.0	0.1	7.2
DAY 4	4	MISSIONS	CHG 2	14	VOLLEYS	AVG	15.8	15.8	2.4	-1.0	16.6
DAY 5	11	MISSIONS	CHG 2	42	VOLLEYS	AVG	12.4	8.2	4.0	2.7	14.0
DAY 6	8	MISSIONS	CHG 2	50	VOLLEYS	AVG	3.7	3.7	3.9	3.9	8.5
TOTAL	58	MISSIONS		257	VOLLEYS		8.0	-0.8	3.3	1.0	10.2

DAY 1
19 APR 05
A BTRY 2-2 FA

M119
CHG 3
AVG RNG 3022 M

12 MISSIONS
47 VOLLEYS

RADIAL ERROR
MEAN – 5.3 M
MEDIAN – 8.0

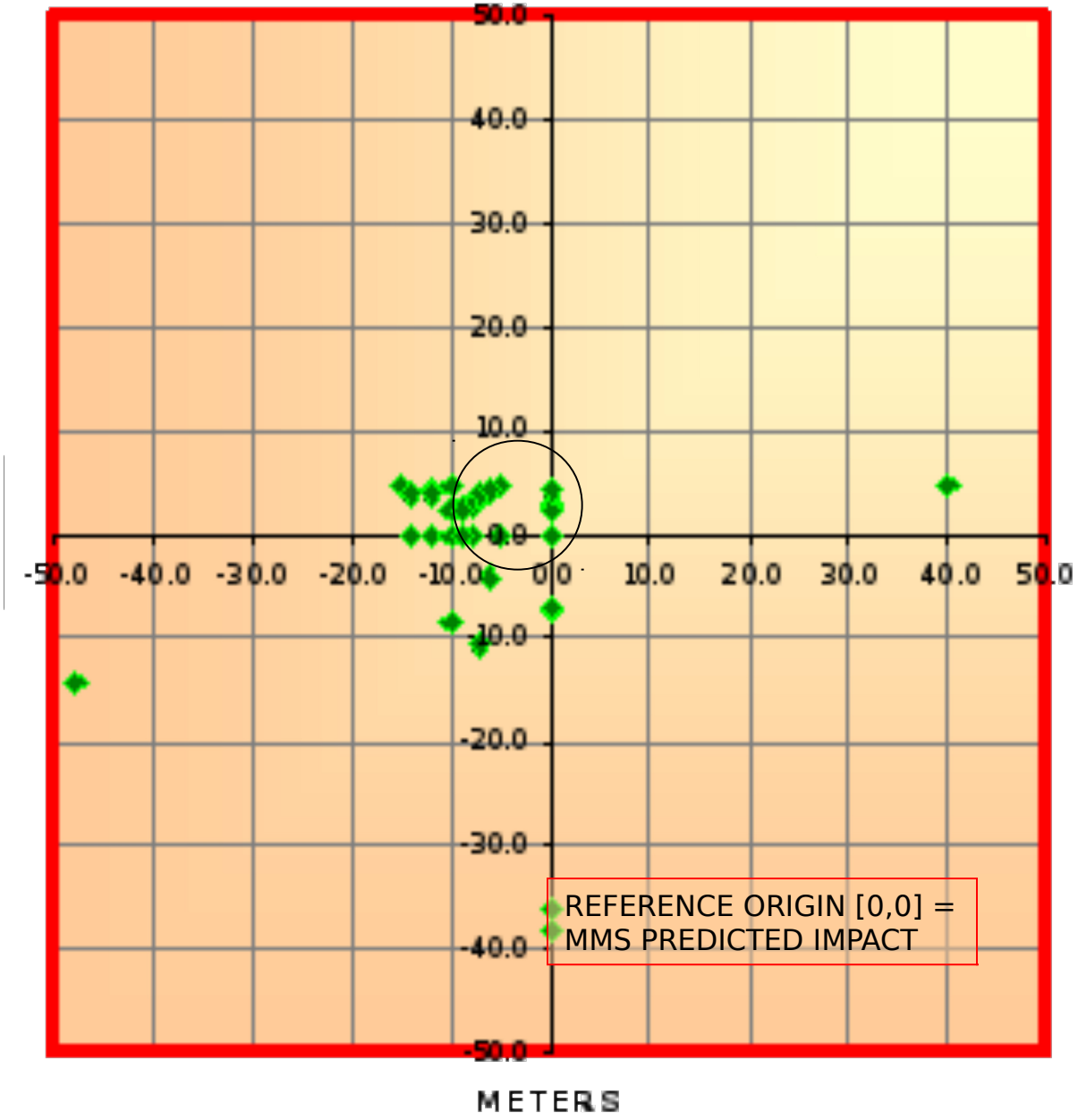


DAY 2
20 APR 05
B BTRY 2-2 FA

M119
CHG 3
AVG RNG 3659 M

14 MISSIONS
70 VOLLEYS

RADIAL ERROR
MEAN – 12.5 M
MEDIAN – 8.2 M

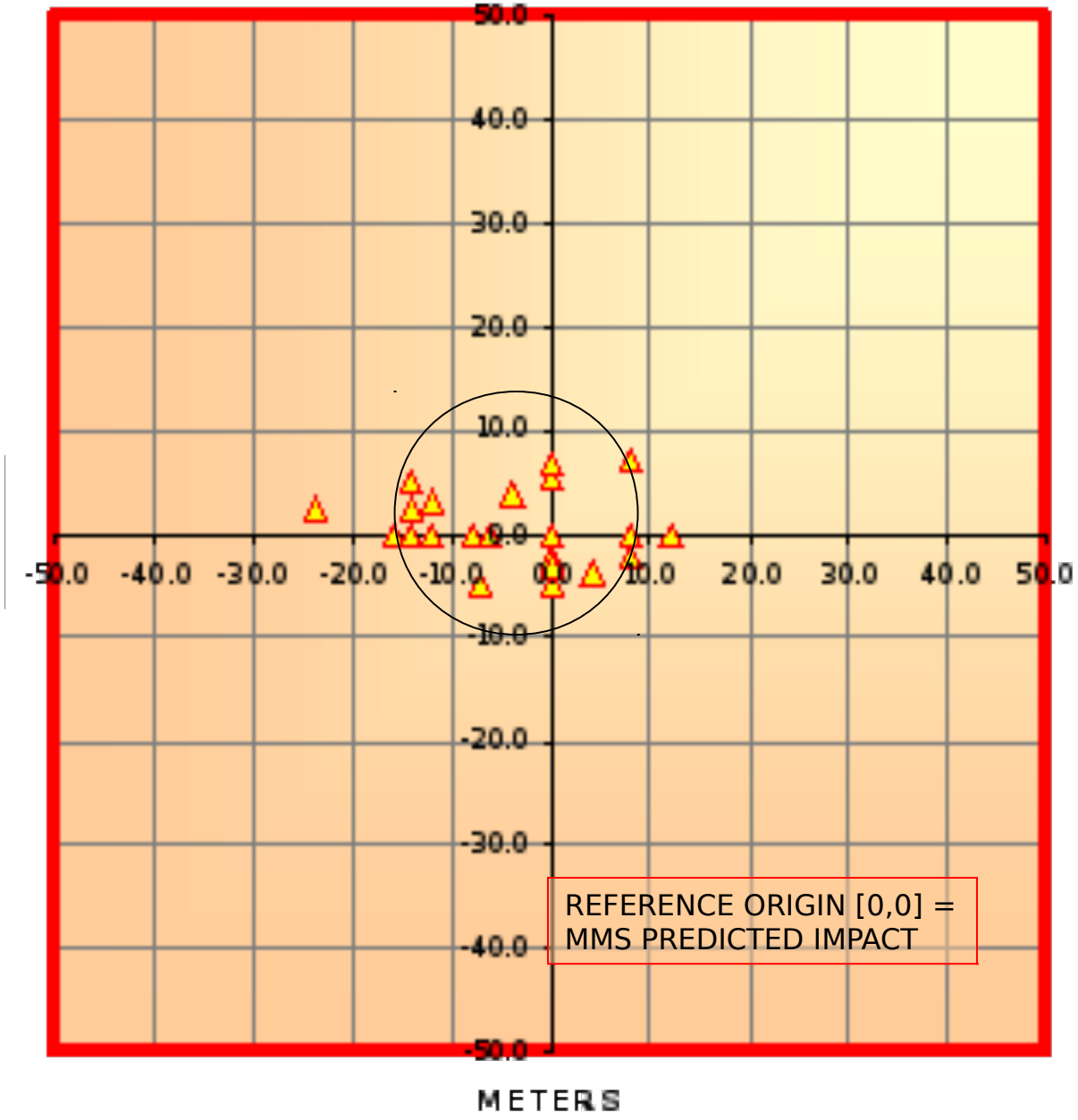


DAY 3
26 APR 05
C BTRY 2-2 FA

M119
CHG 2
AVG RNG 2773 M

19 MISSIONS
34 VOLLEYS

RADIAL ERROR
MEAN – 7.2 M
MEDIAN – 11.3

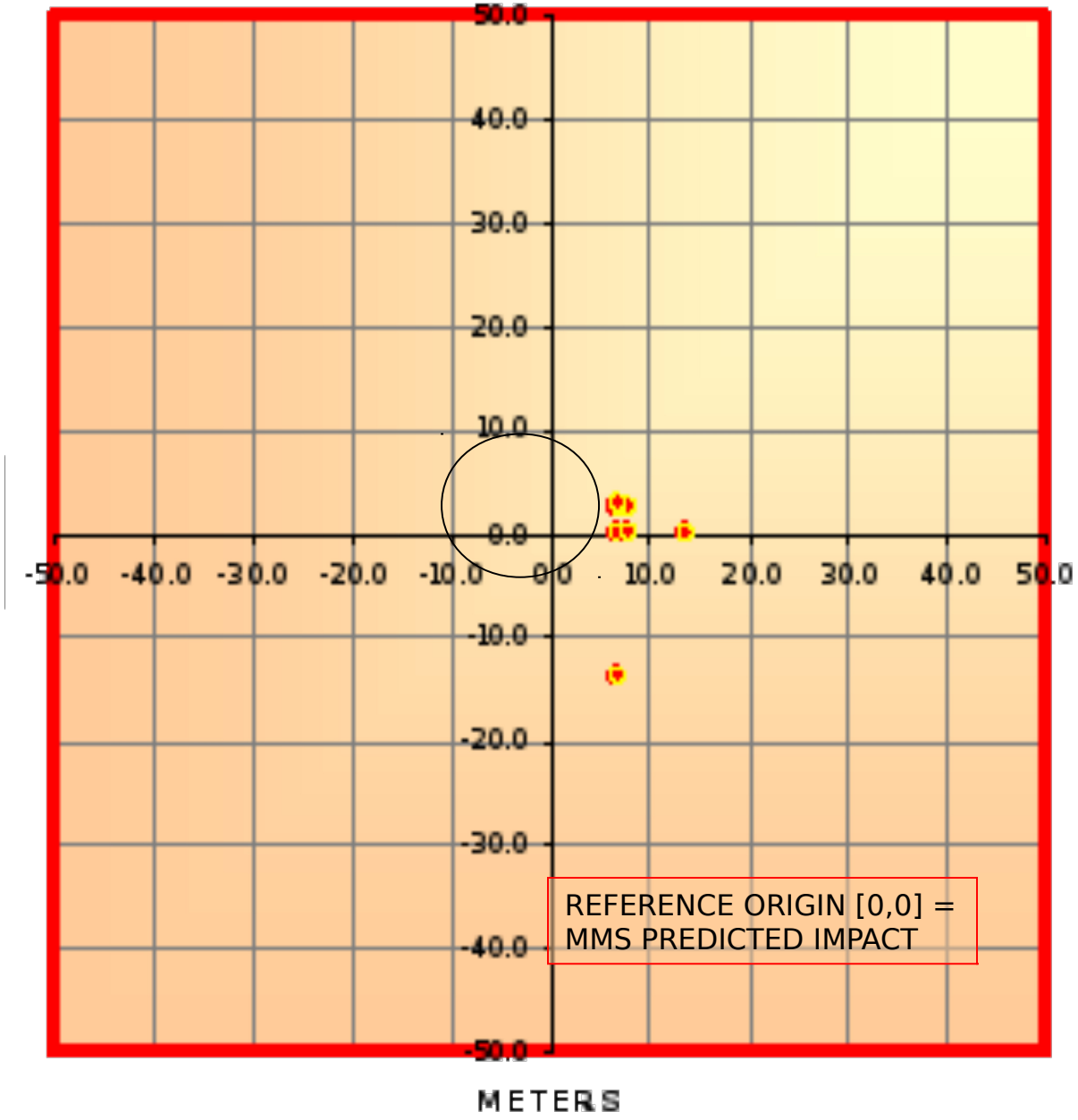


DAY 4
27 APR 05
C BTRY 2-2 FA

M119
CHG 2
AVG RNG 2472 M

4 MISSIONS
14 VOLLEYS

RADIAL ERROR
MEAN – 16.6 M
MEDIAN – 8.0

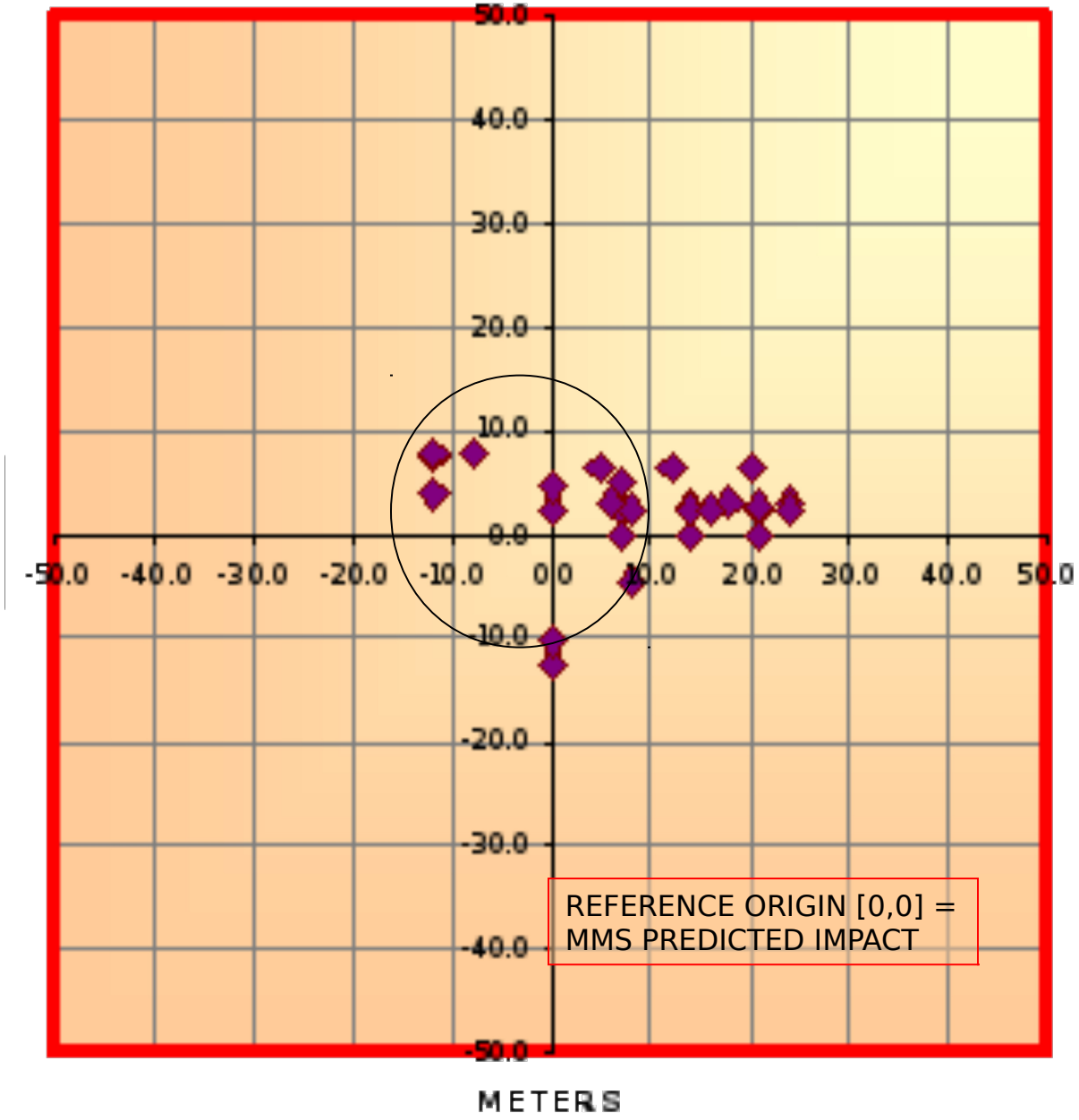


DAY 5
28 APR 05
C BTRY 2-2 FA

M119
CHG 2
AVG RNG 2904 M

11 MISSIONS
42 VOLLEYS

RADIAL ERROR
MEAN – 14.0 M
MEDIAN – 12.6 M

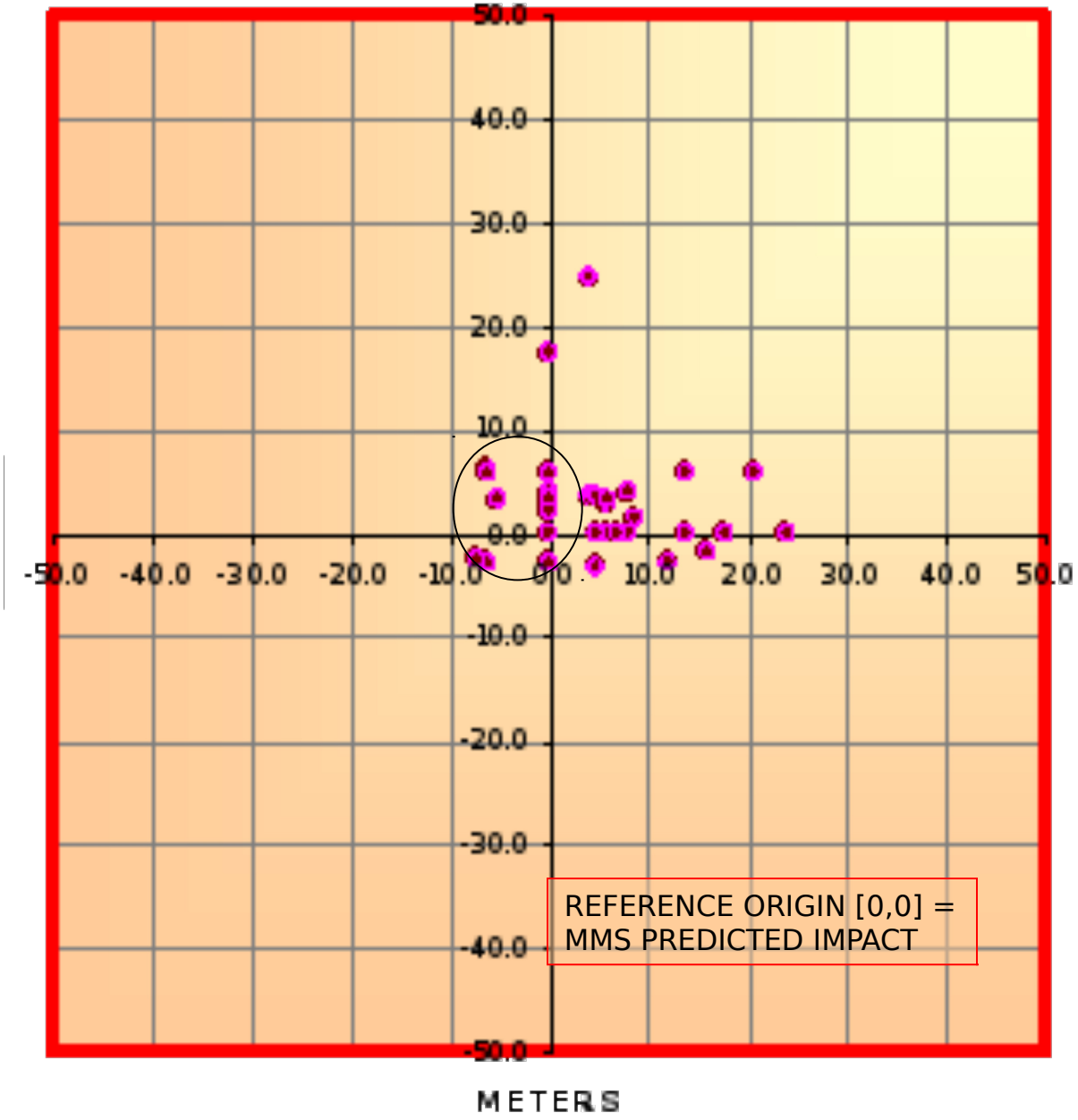


DAY 6
12 MAY 05
C BTRY 2-2 FA

M119
CHG 2
AVG RNG 2760 M

8 MISSIONS
50 VOLLEYS

RADIAL ERROR
MEAN – 8.5 M
MEDIAN – 6.0 M



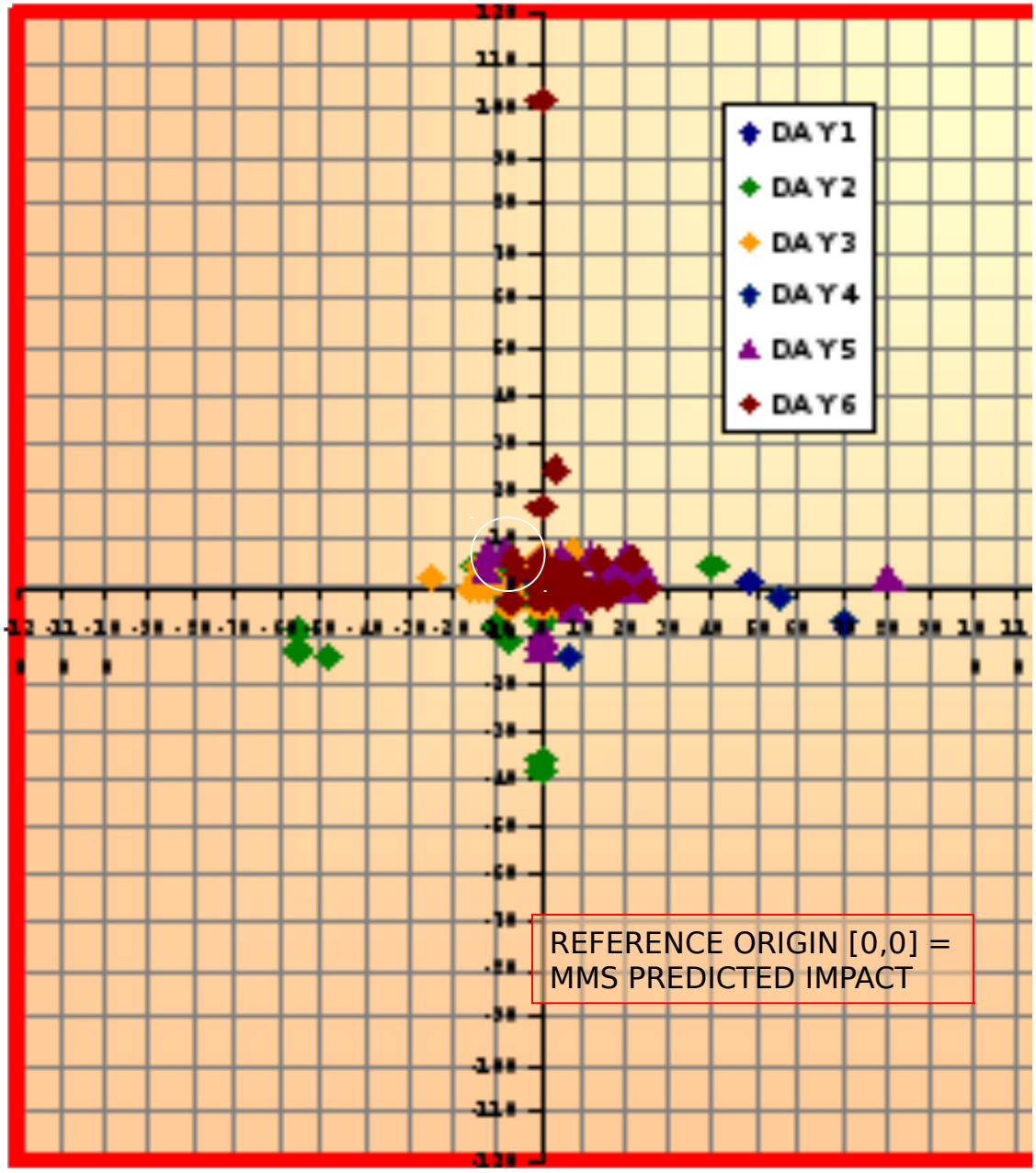
ALL DATA

(INCLUDING ALL OUTLIERS)

68 MISSIONS
257 VOLLEYS

RADIAL ERROR :

MEAN **10.2 M**
MEDIAN **8.0 M**



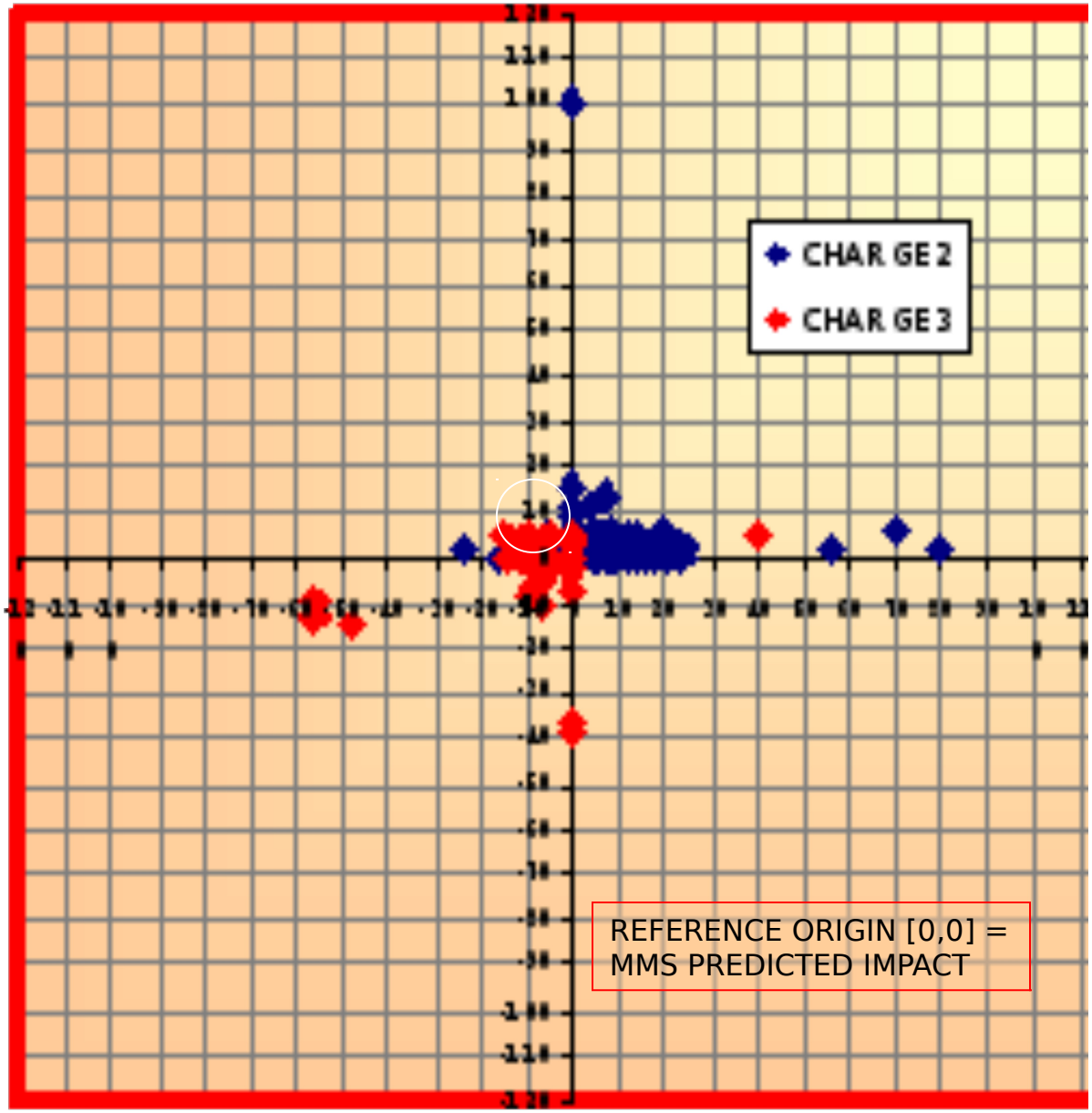
ALL DATA

(BY CHARGE)

68 MISSIONS
257 VOLLEYS

RADIAL ERROR :

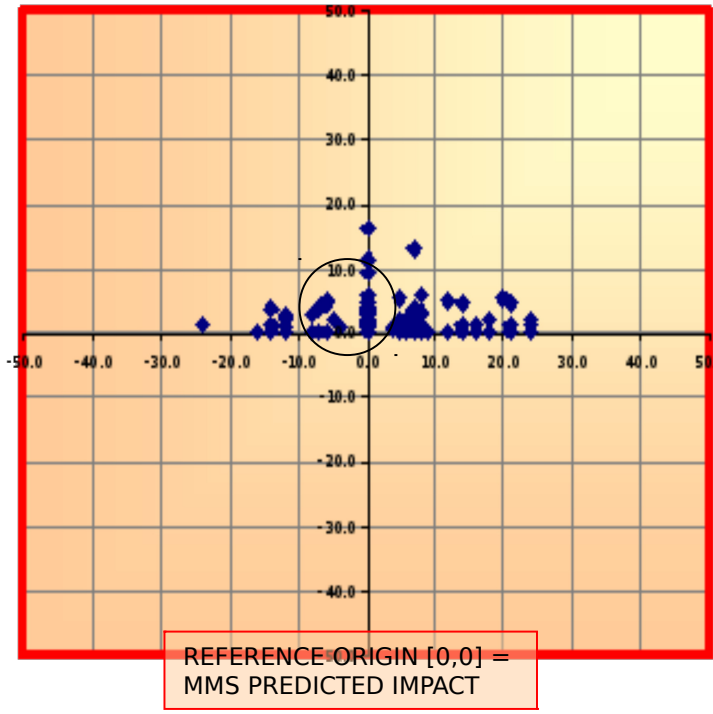
MEAN **10.2 M**
MEDIAN **8.0 M**



Compared to MMS impact data, AFWA had a mean radial error of:

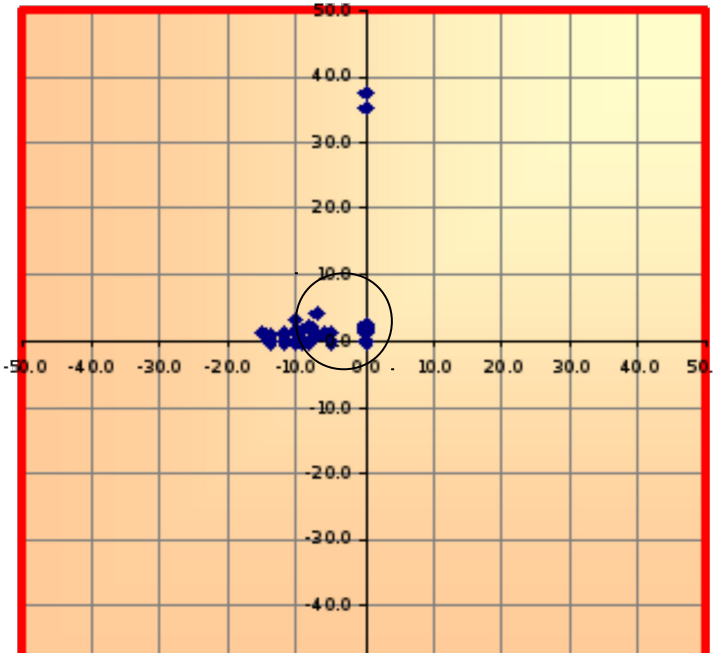
CHARGE 2

RADIAL ERROR
MEAN **8.6 METERS**
MEDIAN **8.0 METERS**

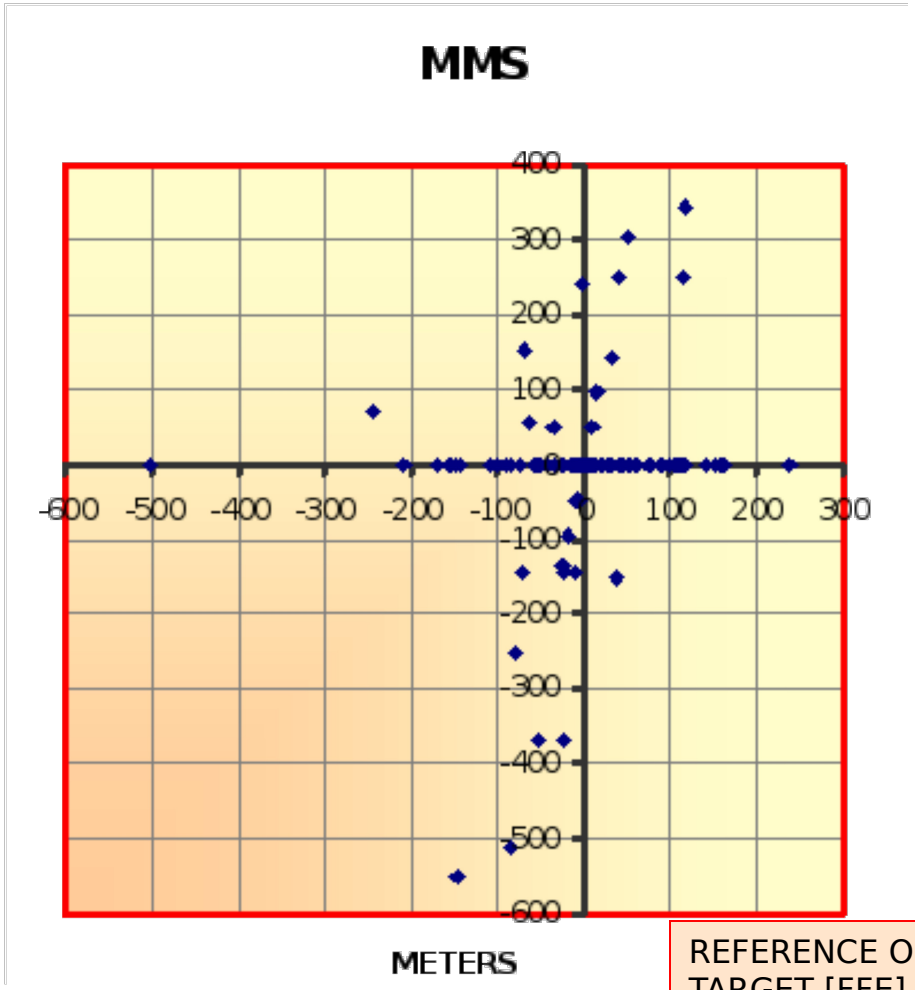


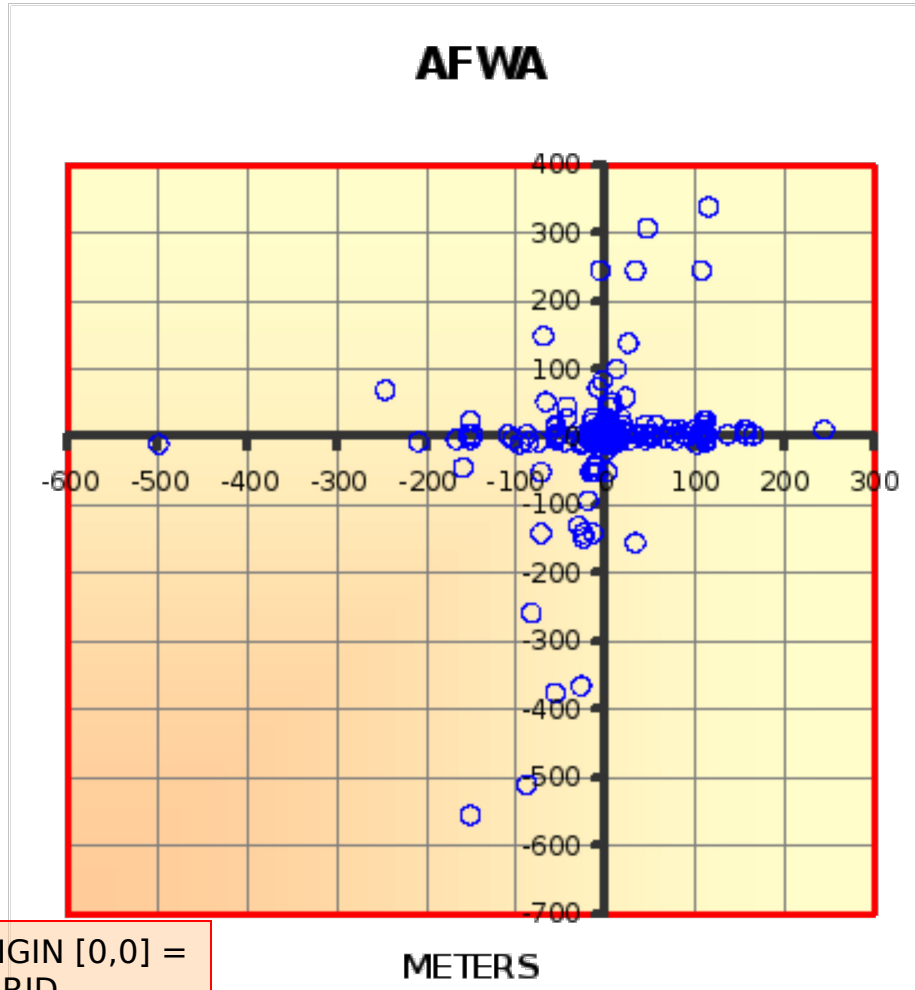
CHARGE 3

RADIAL ERROR
MEAN **7.5 METERS**
MEDIAN **7.8 METERS**



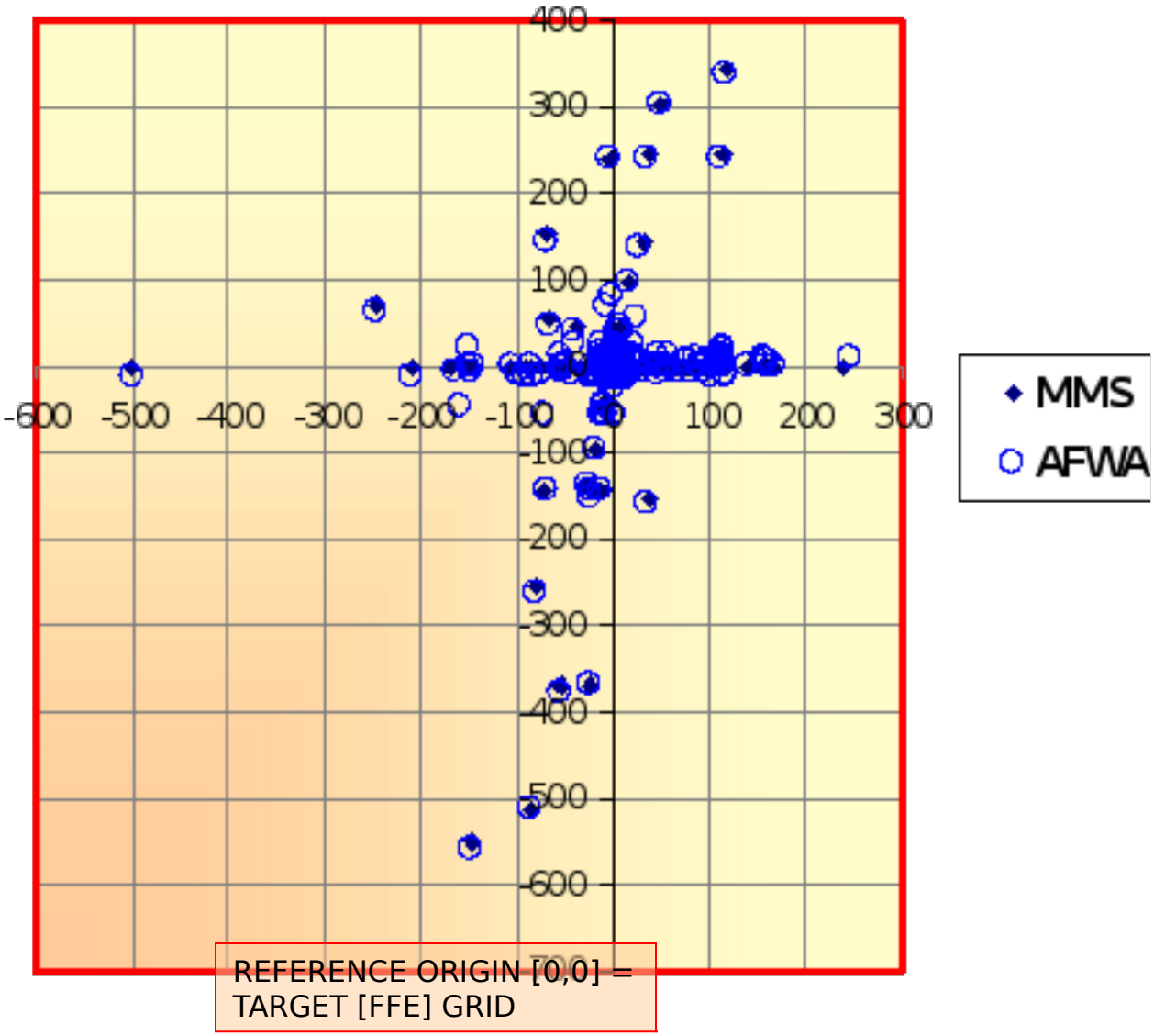
Compared to TARGET data,
Both MMS and AFWA display similar distribution





REFERENCE ORIGIN [0,0] =
TARGET [FFE] GRID

MMS and AFWA compared to TARGET [FFE] data



PROS

- Availability of data
- Less data decay
- Provides model-predicted forecast

CONS

- No official agreement with AFWA
- Requires Internet access
- Lack of local observation data input

CONCLUSIONS

- Current MET from MMS or MMS-Profiler should be the primary source of MET data when available
- AFWA should be considered a reasonable secondary source of artillery MET data if MMS is not available
- AFWA proves to be more accurate in computing gunnery solution than Standard (Default) MET
- Median radial error was consistently within effects radius of weapon system
- AFWA data does appear to support the five requirements for accurate predicted fire